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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is included. (AG)

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S-36

April 1971

U.S. Training and
Employment Service
Technical Report

S-36

Development of USTES

APTITUDE TEST BATTERY FOR

ENGINEER

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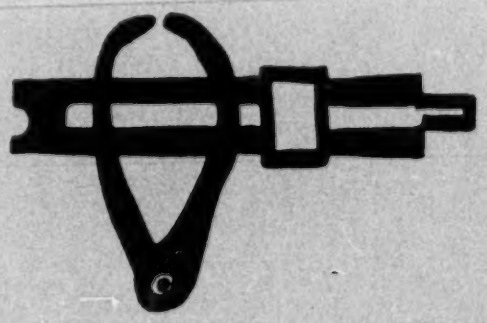

TM 001 226

Technical Report on Development of USTES Aptitude Test Battery

For . . . .

Chemical Engineer (profess. & kin.) 008.081
Civil Engineer (profess. & kin.) 005.081
Electrical Engineer (profess. & kin.) 003.081
Mechanical Engineer (profess. & kin.) 007.081

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U.S. Department of Labor
Manpower Administration

April 1971

FOREWORD

The United States Training and Employment Service General Aptitude Test Battery (GATB) was first published in 1947. Since that time the GATB has been included in a continuing program of research to validate the tests against success in many different occupations. Because of its extensive research base the GATB has come to be recognized as the best validated multiple aptitude test battery in existence for use in vocational guidance.

The GATB consists of 12 tests which measure 9 aptitudes: General Learning Ability, Verbal Aptitude, Numerical Aptitude, Spatial Aptitude, Form Perception, Clerical Perception, Motor Coordination, Finger Dexterity, and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, with a standard deviation of 20.

Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, in combination, predict job performance. For any given occupation, cutting scores are set only for those aptitudes which contribute to the prediction of performance of the job duties of the experimental sample. It is important to recognize that another job might have the same job title but the job content might not be similar. The GATB norms described in this report are appropriate for use only for jobs with content similar to that shown in the job description included in this report.

GATB Study # 586, 601,
575, 735, 736, 736A

Development of USTES Aptitude Test Battery

For

Chemical Engineer (profess. & kin.) 008.081-014
Civil Engineer (profess. & kin.) 005.081-014
Electrical Engineer (profess. & kin.) 003.081-018
Mechanical Engineer (profess. & kin.) 007.081-038

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This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupations of Chemical Engineer (profess. & kin.) 008.081-014, Civil Engineer (profess. & kin.) 005.081-014, Electrical Engineer (profess. & kin.) 003.081-018 and Mechanical Engineer (profess. & kin.) 007.081-038. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB Scores
G-General Learning Ability	125
N-Numerical Aptitude	115
S-Spatial Aptitude	115

Research Summary

Sample:

60 males employed as Engineers in Pennsylvania and Ontario, Canada. (Additional data for employed Engineers not included in the validation sample are shown in Appendix A.)

This study was conducted prior to the requirement of providing minority group information. Therefore, minority group composition is not known.

Criterion:

Supervisory ratings.

Design:

Concurrent (test and criterion data were collected at approximately the same time).

Minimum aptitude requirements were determined on the basis of a job analysis and statistical analyses of aptitude mean scores, standard deviations, aptitude-criterion correlations and selective efficiencies.

Concurrent Validity:

Phi Coefficient = .33 (P/2 ∠ .01)

Effectiveness of Norms:

Only 68% of the nontest-selected workers used for this study were good workers; if the workers had been test-selected with the above norms, 77% would have been good workers. Thirty-two percent of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the above norms, only 23% would have been poor workers. The effectiveness of the norms is shown graphically in Table 1:

TABLE I

Effectiveness of Norms

	Without Tests	With Tests
Good Workers	68%	77%
Poor Workers	32%	23%

SAMPLE DESCRIPTION

Size:

N = 60

Occupational Status:

Employed Workers.

Work Setting:

Workers were employed by Dravo Corporation in Pittsburgh, Pennsylvania and the Polymer Corporation, Sarnia, Ontario, Canada.

Employer Selection Requirements:

Education: College graduate with Engineering degree.

Previous Experience: None specified

Tests: None used.

Principal Activities:

The job duties for each worker are comparable to those shown in the job description in the Appendix.

Minimum Experience:

All workers in the final sample had at least one month of job experience.

TABLE 2

Means, Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education, Experience
N=60

	Mean	SD	Range	r^1 N=14	r^2 N=29	r^3 N=17
Age (years)	33.4	7.8	22-55	.112	.382*	.241
Education (years)	16.1	.4	16-18	---	---	—.113
Experience (months)	74.4	74.1	1-324	.033	.504**	.065

* Significant at the .05 level.
** Significant at the .01 level.

1. Junior engineers at Dravo (less than 3 years experience)
2. Senior engineers at Dravo (more than 3 years experience)
3. Engineers at Polymer

EXPERIMENTAL TEST BATTERY

All the tests of the GATB, B-1001, except Part E were administered to the sample in April 1949 and April 1950. All B-1001 scores were converted to equivalent B-1002 scores.

CRITERION

The criterion data consisted of separate over-all rank order ratings. The senior engineers at the Dravo Corporation were rated by the Assistant General Manager of the Engineering Works Division. The rank order ratings of the Junior engineers at the Dravo Company were prepared by two supervisors. The engineers at the Polymer Corporation were ranked by two supervisors on job efficiency, so there were two ratings. These scores were converted into quantitative scores, then combined and averaged, resulting in a criterion score based on the rankings of two supervisors.

Reliability:

No estimate of the reliability of the criterion was obtained.

Criterion Dichotomy:

The criterion distribution was dichotomized into low and high groups by placing 32% of the sample in the low group to correspond with the percentage of workers considered unsatisfactory or marginal. Workers in the high criterion group were designated as "good workers" and those in the low group as "poor workers."

APTITUDES CONSIDERED FOR INCLUSION IN THE NORMS

Aptitudes were selected for tryout in the norms on the basis of a qualitative analysis of job duties involved and a statistical analysis of test and criterion data. Aptitudes V and S which did not have a high correlation with the criteria of two of the three subsamples were considered for inclusion in norms because the qualitative analysis indicated that the aptitudes might be important for the job duties and the sample had relatively low standard deviation on these aptitudes. Tables 3, 4 and 5 show the results of the qualitative and statistical analyses.

TABLE 3

Qualitative Analysis
(Based on the job analysis, the aptitudes indicated appear to be important to the work performance)

Aptitudes	Rationale
G - General Learning Ability	Required in learning and understanding fundamentals in the field of engineering, for the planning and designing involved in engineering projects and for conducting research and development work.
V - Verbal Aptitude	Required in reading and understanding reference materials and in writing reports.
N - Numerical Aptitude	Required for mathematical computations in applying fundamentals of engineering.
S - Spatial Aptitude	Required in the design and construction of buildings, bridges, chemical processing plants, electrical plants, mechanical equipment, etc.
P - Form Perception	Appears to be important for adequate perception of pictorial detail in test-books and workbooks and in the preparation and reading of plans and blueprints.

TABLE 4

Means, Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes[a] of the GATB; N=60

	Mean	SD	Range	r^1 N=14	r^2 N=29	r^3 N=17
G-General Learning Ability	139.3	12.1	111-183	.640**	.209	.612**
V-Verbal Aptitude	133.5	13.5	86-173	.156	.270	.338
N-Numerical Aptitude	131.3	10.3	96-159	.685**	-.016	.552**
S-Spatial Aptitude	129.8	11.9	103-156	.375	.079	.497*
P-Form Perception	112.9	14.2	80-141	.334	-.031	.159
Q-Clerical Perception	118.8	13.6	91-162	.269	.081	-.003
K-Motor Coordination	115.5	17.6	74-156	-.127	-.015	.115
F-Finger Dexterity	103.6[b]	16.9	62-141	.237	.363*	-.008
M-Manual Dexterity	103.4[b]	19.3	61-141	.260	.067	-.005

* Significant at the .05 level.
** Significant at the .01 level.
[a] B-1001 scores were converted to equivalent B-1002 scores
[b] N=59

1. Junior Engineers at Dravo
2. Senior Engineers at Dravo
3. Polymer Engineers

TABLE 5

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes G	V	N	S	P	Q	K	F	M
Job Analysis Data									
Important	X	X	X	X	X				
Irrelevant									
Relatively High Mean	X	X	X						
Relatively Low Standard Dev.	X	X	X	X					
Significant Correlation with Criterion for 2 of the 3 subsamples	X		X						
Aptitudes to be considered for Trial Norms	G	V	N	S					

DERIVATION AND VALIDITY OF NORMS

Final norms were derived on the basis of the degree to which trial norms consisting of various combinations of aptitudes G, V, N, and S at trial cutting scores were able to differentiate between the 68% of the sample considered to be good workers and the 32% of the sample considered to be poor workers. Trial cutting scores at five-point intervals approximately one standard deviation below the mean are tried because this will eliminate about one-third of the sample with three-aptitude norms. For four-aptitude trial norms, cutting scores of slightly less than one standard deviation below the mean will eliminate about one-third of the sample; for two-aptitude trial norms, minimum cutting scores of slightly more than one standard deviation below the mean will eliminate about one-third of the sample. The Phi Coefficient was used as a basis for comparing trial norms. Norms of G-125, N-115 and S-115 provide optimum differentiation for the occupation of Chemical Engineer (profess. & kin.) 008.081-014, Civil Engineer (profess. & kin.) 005.081-014, Electrical Engineer (profess. & kin.) 003.081-018 and Mechanical Engineer (profess. & kin.) 007.081-038. The validity of these norms is shown in Table 6 and is indicated by a Phi Coefficient of .33 (statistically significant at the .01 level).

TABLE 6

Concurrent Validity of Test Norms
G-125, N-115, S-115

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	4	37	41
Poor Workers	8	11	19
Total	12	48	60

Phi Coefficient = .33 Chi Square (X^2Y) = 6.6

Significance Level = $P/2 < .01$

DETERMINATION OF OCCUPATIONAL APTITUDE PATTERN

The data for this study met the requirements for incorporating the occupations studied into OAP-1 which is shown in the 1970 edition of Section II of the Manual for the General Aptitude Test Battery. A Phi Coefficient of .27 is obtained when the OAP-1 norms of G-125, N-115 and S-115 are applied to the validation and two cross validation samples.

CHECK STUDY RESEARCH SUMMARY SHEET FOR S-36

S-36 GATB Study # 575, 735 and 736

Chemical Engineer (profess. & kin.) 008.081-014
Civil Engineer (profess. & kin.) 005.081-014
Electrical Engineer (profess. & kin.) 003.081-018
Mechanical Engineer (profess. & kin.) 007.081-038

Check Study #1 Research Summary

Sample:

214 students enrolled at the University of North Dakota, Case Institute of Technology or the University of Utah. Additional data for students not included in this cross-validation sample are shown in Appendix B. This study was conducted prior to the requirement of providing minority group status. Therefore, minority group composition is unknown.

TABLE 7

Means, Standard Deviations (SD), Ranges, and Pearson Product-Moment Correlations with the Criterion (r) For Aptitudes[a] G, V, N, S, P, and Q of the GATB. N=214.

	Mean	SD	Range	r^1 (N=51)	r^2 (N=92)	r^3 (N=71)
G-General Learning Ability	137.8	12.1	114-180	.021	.516 **	.404**
V-Verbal Aptitude	128.8	14.4	88-165	.076	.349 **	.317*
N-Numerical Aptitude	129.1	11.0	102-157	.012	.350 **	.385**
S-Spatial Aptitude	133.1	14.2	77-158	.115	.249 **	.121
P-Form Perception	123.5	15.8	90-163	-.142	.298 **	.184
Q-Clerical Perception	119.0	16.0	86-154	-.156	.327 **	.448**

All students in the sample were senior engineering students.

r^1 Case University students

r^2 University of Utah students

r^3 University of North Dakota students

[a] B-1001 scores were converted to equivalent B-1002 scores.

Criterion:

School grades

Design:

Concurrent (test and criterion data were collected at approximately the same time in 1948, 1949 and 1950.)

Concurrent Validity:

Phi Coefficient = .18 (P/2 ≤.005)

Effectiveness of Norms:

Only 66% of the nontest-selected students used for this study were good students; if the students had been test-selected with the S-36 norms, 71% would have been good students. Thirty-four percent of the nontest-selected students used for this study were poor students; if the students had been test-selected with the S-36 norms, only 29% would have been poor students. The effectiveness of the norms when applied to this independent sample is shown graphically in Table 8.

TABLE 8

Effectiveness of S-36 Norms
on Check Study Sample #1

	Without Tests	With Tests
Good Students	66%	71%
Poor Students	34%	29%

TABLE 9

Concurrent Validity of S-36 Norms
On Check Study Sample #1

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Students	20	122	142
Poor Students	22	50	72
Total	42	172	214

Phi Coefficient (Ø) = .18
Significance Level = P/2 < .005

Chi Square (X^2Y) = 7.2

CHECK STUDY RESEARCH SUMMARY SHEET FOR S-36

S-36

GATB Study # 736A

Chemical Engineer (profess. & kin.) 008.081-014
Civil Engineer (profess. & kin.) 005.081-014
Electrical Engineer (profess. & kin.) 003.081-018
Mechanical Engineer (profess. & kin.) 007.081-038

Check Study #2 Research Summary

Sample:

150 students enrolled in the College of Engineering at the University of Tennessee.
This study was conducted prior to the requirement of providing minority group status. Therefore, minority group composition is unknown.

TABLE 9

Means, Standard Deviations (SD), Ranges, and Pearson Product-Moment Correlations with the Criterion (r) for Aptitudes[a] of the GATB N=150

	Mean	SD	Range	r
G-General Learning Ability	129.8	12.4	95-165	.42**
V-Verbal Aptitude	118.9	14.9	73-158	.40**
N-Numerical Aptitude	122.3	11.5	87-155	.38**
S-Spatial Aptitude	129.7	14.3	79-158	.11
P-Form Perception	118.3	11.7	85-170	.11
Q-Clerical Perception	110.0	15.2	84-158	.30**
K-Motor Coordination	112.7	16.6	76-156	.25**
F-Finger Dexterity	105.6	17.5	62-172	.08
M-Manual Dexterity	110.9	17.1	70-163	.01

La

B-1001 Scores were converted to equivalent B-1002 scores

Criterion:

School grades

Design:

Concurrent (test and criterion data were collected at approximately the same time in 1952.)

Concurrent Validity:

Phi Coefficient = .29 (P/2 < .0005)

Effectiveness of Norms:

Only 56% of the nontest-selected students used for this study were good students; if the students had been test-selected with the S-36 norms,

68% would have been good students. Forty-four percent of the nontest-selected students used for this study were poor students; if the students had been test-selected with the S-36 norms, only 32% would have been poor students. The effectiveness of the norms when applied to this independent sample is shown graphically in Table 10.

TABLE 10

Effectiveness of S-36 Norms
on Check Study Sample #2

	Without Tests	With Tests
Good Students	56%	68%
Poor Students	44%	32%

TABLE 11

Concurrent Validity of S-36 Norms
on Check Study Sample #2

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Students	21	63	84
Poor Students	36	30	66
Total	57	93	150

Phi Coefficient (ϕ) = .29

Significance Level - $P/2 < .0005$

Chi Square ($X^2 Y$) = 12.5

Appendix A

Validation Sample

A total of 180 employed engineers were tested with the GATB. However, only 60 of these were used for the validation study since criterion data were not available for the remainder of the sample. The workers not included in the validation sample were employed at the following companies: General Electric Company, Erie, Pennsylvania; Parsons, Brinckerhoff, Hall and Mac Donald, New York City; Sun Oil Company, Marcus Hook, Pennsylvania; U.S. Navy Yard, Portsmouth, New Hampshire and the Ogden Arsenal, Ogden, Utah. The distribution of the total employed by major course of study in college is as follows:

Course of Study	Number in Course
Chemical Engineering	47
Mechanical Engineering	56
Electrical Engineering	39
Civil Engineering	31
Other Fields in Engineering (This group includes Naval Architect, Metallurgical Engineer and Marine Engineer)	7

The mean scores and standard deviations for the aptitudes of the GATB (converted to B-1002 scores) are shown in the table below:

Aptitude	M	SD	N
G - General Learning Ability	139.3	12.4	180
V - Verbal Aptitude	131.1	14.4	180
N - Numerical Aptitude	132.0	10.3	180
S - Spatial Aptitude	131.2	13.9	180
P - Form Perception	117.9	15.6	180
Q - Clerical Perception	119.9	13.0	148
K - Motor Coordination	118.2	15.3	180
F - Finger Dexterity	106.9	17.6	158
M - Manual Dexterity	111.3	20.4	158

The following table indicates the Means, Standard Deviations and Aptitudes of the GATB for each of the four categories of total employed Engineer sample.

TABLE 12

Means (M) and Standard Deviations(SD) for the Aptitudes of the GATB

Engineers

Employed Samples

APTITUDE	CHEMICAL ENGINEER			CIVIL ENGINEER			ELECTRICAL ENGINEER			MECHANICAL ENGINEER		
	M	SD	N*	M	SD	N*	M	SD	N*	M	SD	N*
G - General Learning Ability	137.4	11.9	47	138.9	9.6	31	144.3	14.3	36	138.2	10.5	43
V - Verbal Aptitude	132.8	13.2	47	129.2	16.1	31	132.8	11.5	36	130.1	13.8	43
N - Numerical Aptitude	132.3	10.4	47	134.0	7.6	31	133.9	11.2	36	130.4	10.0	43
S - Spatial Aptitude	122.9	14.0	47	132.0	12.5	31	137.8	13.8	36	133.0	12.3	43
P - Form Perception	117.1	14.7	47	115.5	16.2	31	123.5	15.0	36	118.6	16.5	43
Q - Clerical Perception	122.4	11.8	47	118.0	13.2	31	105.0	8.3	4	120.3	13.5	43
K - Motor Coordination	113.3	15.0	47	116.4	16.7	31	125.0	15.6	36	118.3	12.6	43
F - Finger Dexterity	101.1	18.2	46	101.0	15.8	10	115.9	14.4	36	108.5	18.0	43
M - Manual Dexterity	103.7	19.6	46	96.2	19.9	10	122.3	17.2	36	116.3	18.2	43

* Number of People in Employed Sample per Company

Chemical Engineer: Sun Oil Company 30; Polymer Corporation 17

Civil Engineer: Dravo Corporation 10; Parsons, Brinckerhoff, Hall and MacDonald Company 21

Electrical Engineer: General Electric Company 32; Dravo Corporation 4

Mechanical Engineer: Dravo Corporation 18; General Electric Company 25

Appendix B

Cross Validation Sample

A total of 235 students were tested with the GATB although only 214 students were included in the final sample. The additional students were enrolled in the University of Delaware. The distribution of these students by major course of study is as follows:

Course of Study	Number in Course
Chemical Engineering	69
Civil Engineering	21
Electrical Engineering	73
Mechanical Engineering	44
Other Fields in Engineering	28

(This group includes majors in Industrial Engineering, Geology and Mineral Studies, and Mining Engineering.)

The mean scores and standard deviations for the aptitudes of the GATB (converted to B-1002 scores) for all tested individuals in the student sample are shown in the table below:

Aptitude	M	SD	N
G - General Learning Ability	138.2	11.9	235
V - Verbal Aptitude	129.1	14.1	235
N - Numerical Aptitude	129.3	10.8	235
S - Spatial Aptitude	133.7	14.0	235
P - Form Perception	123.7	15.7	235
Q - Clerical Perception	119.5	15.9	235
K - Motor Coordination	122.4	18.5	164
F - Finger Dexterity	110.8	19.0	72
M - Manual Dexterity	116.6	20.5	72

The following table indicates the Means, Standard Deviations and Aptitudes of the GATB for each of the three categories of total student Engineer sample.

TABLE 13

Means (M) and Standard Deviations (SD) for the Aptitudes of the GATB

Engineers
Student Samples

APTITUDE	CHEMICAL ENGINEER M	SD	N*	ELECTRICAL ENGINEER M	SD	N*	MECHANICAL ENGINEER M	SD	N*
G - General Learning Ability	143.3	9.7	62	135.5	12.0	51	136.6	11.0	34
V - Verbal Aptitude	137.0	10.9	62	126.5	13.9	51	122.7	12.1	34
N - Numerical Aptitude	131.8	10.2	62	127.0	9.9	51	123.5	9.6	34
S - Spatial Aptitude	137.9	10.9	62	130.6	15.9	51	131.3	14.2	34
P - Form Perception	131.0	14.9	62	119.4	14.8	51	120.9	14.7	34
Q - Clerical Perception	131.2	12.9	62	121.4	13.9	51	113.7	17.2	34
K - Motor Coordination	128.3	16.2	62	118.4	19.6	51	119.5	18.7	34
F - Finger Dexterity	110.1	19.4	58	131.6	13.7	3	107.7	18.6	9
M - Manual Dexterity	120.2	19.2	58	110.2	19.2	3	101.3	19.2	9

*Number of People in Student Sample per School

Chemical Engineer: Case Institute 51; University of Delaware 7; University of Utah 4

Electrical Engineer: University of Utah 48; University of Delaware 3

Mechanical Engineer: University of Delaware 9; University of Utah 25

Civil Engineer: Insufficient data- student sample of 4 people

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FACT SHEET

Job Title

Chemical Engineer (profess. & kin.) 008.081-014
Civil Engineer (profess. & kin.) 005.081-014
Electrical Engineer (profess. & kin.) 003.081-018
Mechanical Engineer (profess. & kin.) 007.081-038

Job Summary

Applies physical laws and principles of engineering for development and utilization of materials, processes, structures, systems, equipment, and machines.

Work Performed

Chemical Engineer: Designs chemical-plant equipment and devises processes for producing chemicals and products such as synthetic rubber, soap, aluminum, and gasoline, applying principles of chemistry, physics, mechanical and electrical engineering, and related areas. Conducts research to develop new and improved chemical manufacturing processes. Designs, plans layout, and oversees workers engaged in constructing, controlling, and improving equipment for carrying out chemical processes on commercial scale. Determines most effective arrangement of operations, such as mixing, crushing, heat transfer, distillation, oxidation, hydrogenation, and polymerization. Oversees workers controlling equipment, such as condensers, absorption and evaporation towers, columns, and stills.

Civil Engineer: Plans, designs, and oversees construction and maintenance of structures and facilities, such as roads, railroads, airports, bridges, harbors, channels, dams, irrigation projects, pipelines, power plants, water and sewage systems, and waste disposal units.

Electrical Engineer: Applies principles of electrical engineering to design, plan, and oversee manufacture, construction, installation, and maintenance of electronic components, equipment, systems, facilities, and machinery used in generation, transmission, distribution, and utilization of electrical energy. Plans and oversees construction, installation, and operation of electric-power generating plants, transmission lines, and distribution, illumination, wire communication, and electric transportation systems. Designs and develops radio, television, electronic, and allied equipment, and oversees technical operation of broadcasting stations. Designs and oversees manufacture of various types of electrical machinery and apparatus, such as motors and generators, connectors and rectifiers, transformers and regulators, switchgear and welding equipment. May work in research, consulting, inspection, testing, specification and other technical writing, and sales and service of complex electrical equipment.

Mechanical Engineer: Plans and designs tools, engines, machines, and other mechanical equipment; and oversees installation, operation, maintenance, and repair of mechanical equipment, including centralized heat, gas, water, and steam systems. May work in research, consulting, inspecting, testing, specifications, and other technical writing, or technical sales and service work.

Effectiveness of Norms

Validation Sample: Only 68% of the non-test-selected workers used for this study were good workers; if the workers had been test-selected with the S-36 norms, 77% would have been good workers. 32% of the non-test-selected workers used for this study were poor workers; if these workers had been test-selected with the S-36 norms, only 23% would have been poor workers.

Cross Validation I: Only 66% of the non-test-selected students used for this study were good students; if the students had been test-selected with the S-36 norms, 71% would have been good students. 34% of the non-test-selected students used for this study were poor students; if these students had been test-selected with the S-36 norms, only 29% would have been poor students.

Cross Validation II: Only 56% of the non-test-selected students used for this study were good students; if the students had been test-selected with the S-36 norms, 68% would have been good students. Forty-four percent of the non-test-selected students used for this study were poor students, if these students had been test-selected with the S-36 norms, only 32% would have been poor students.

Applicability of S-36 Norms:
The aptitude test battery is applicable to jobs which include a majority of duties described above.

GPO 909.173